Assessing the status of McKay's Buntings

Steve Matsuoka and Jim Johnson
U.S. Fish and Wildlife Service, Migratory Bird Management

McKay's Bunting:

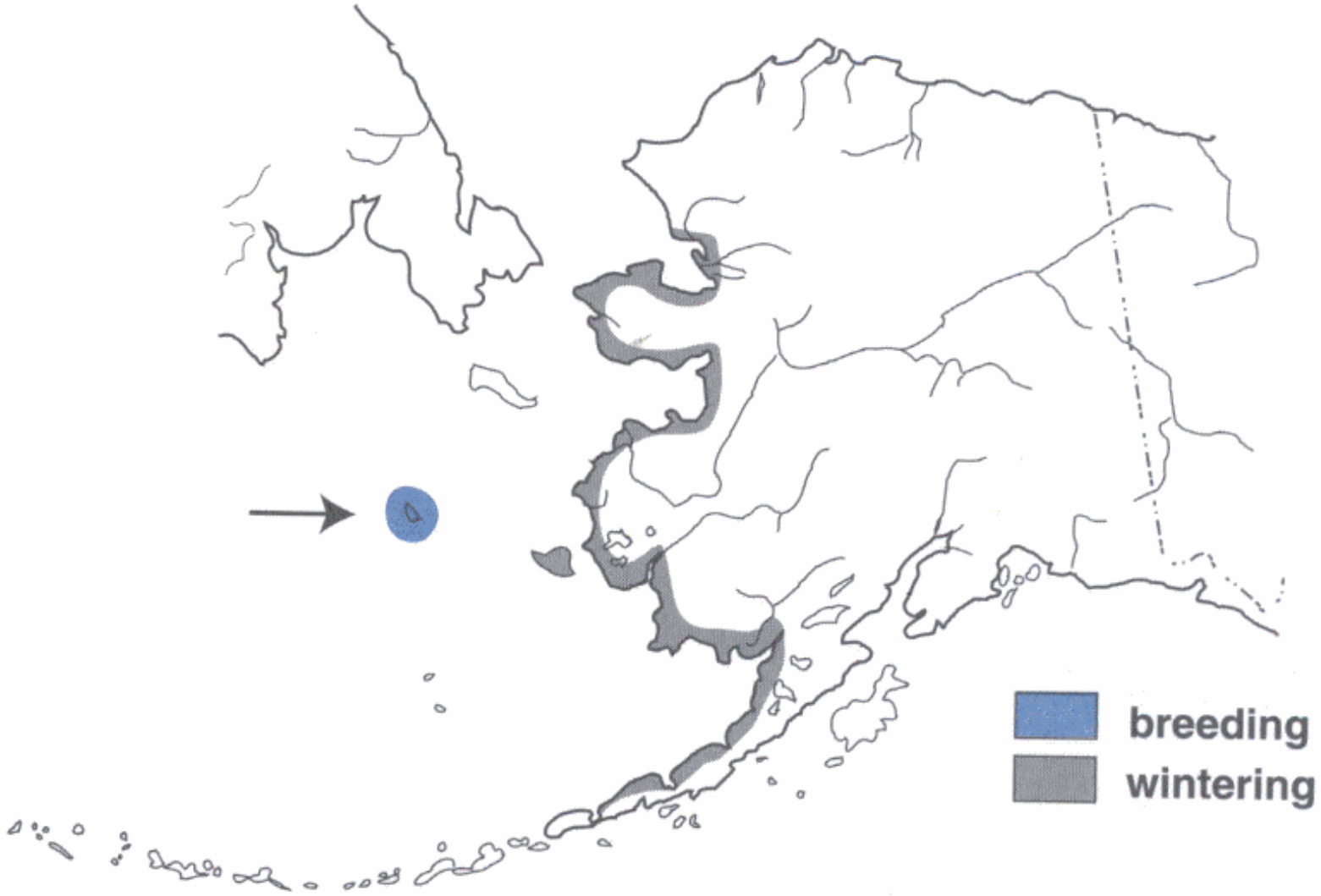
A priority species

Speculate that there are 2,000-6,000 birds in the world.

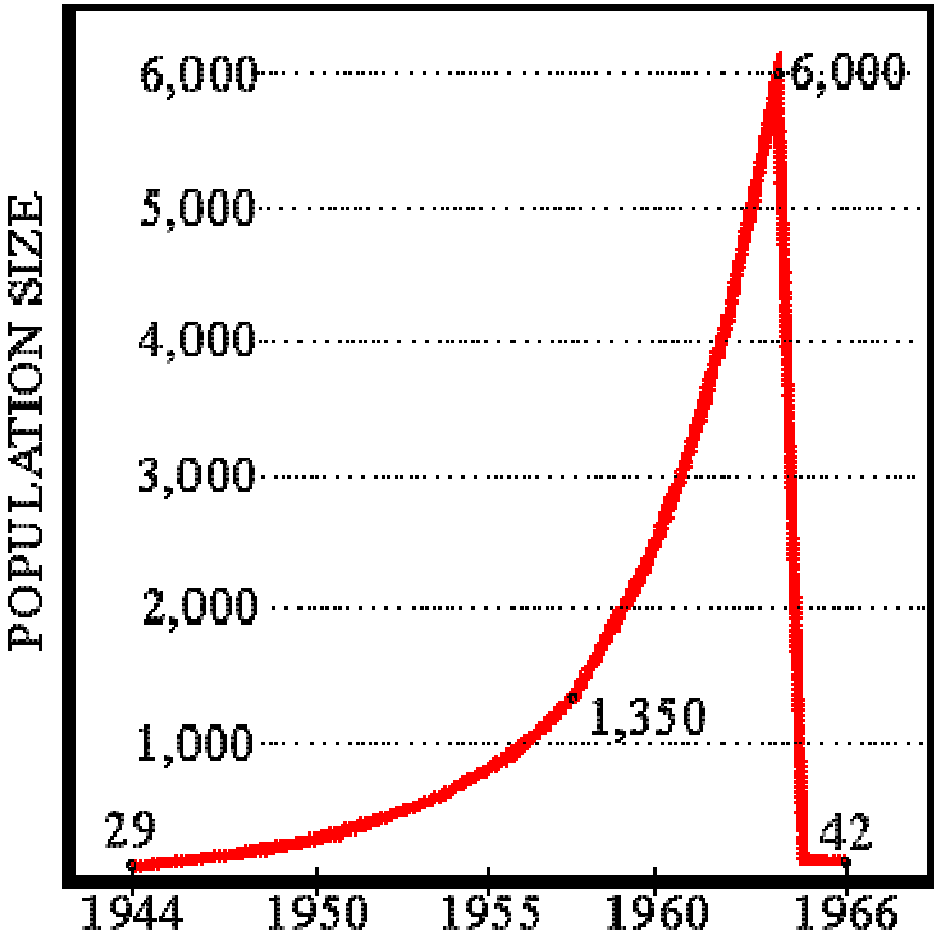
- One of the rarest birds in North America.
- 10 other terrestrial bird species with < 10,000.
- 7 are endangered or threatened.

Most poorly studied bird in North America.

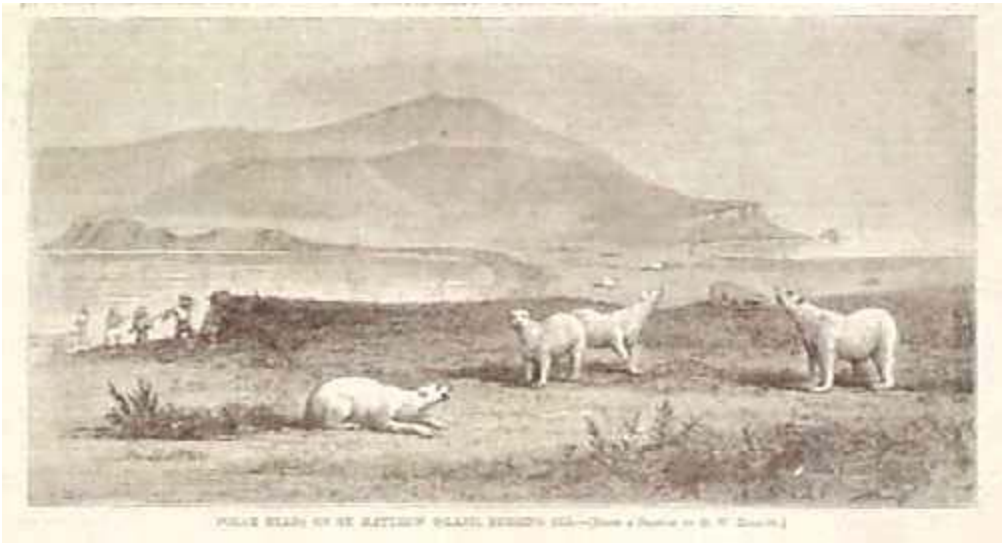
McKay's Bunting Range



Introduced Species



Global warming



Harper’s Weekly, titled "Polar Bears on St. Matthew Island, Behring Sea.“ 1875

Development

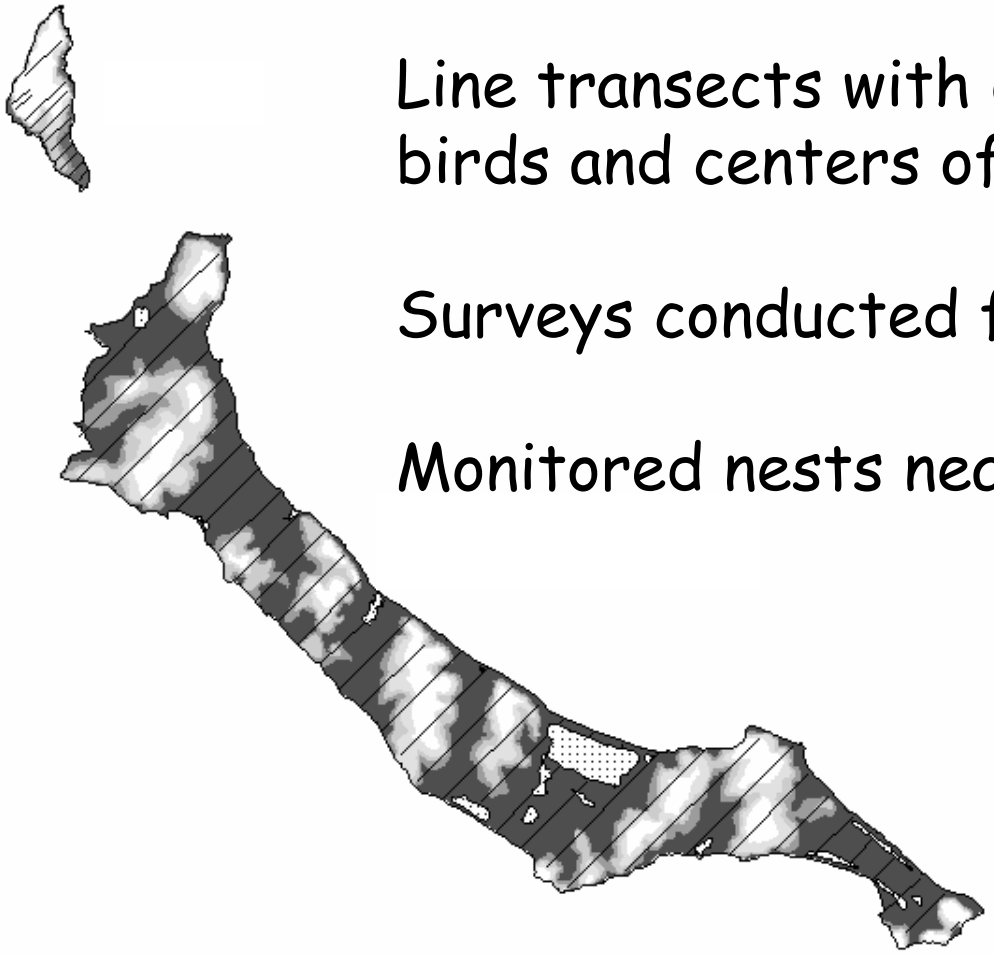
Objectives

- Estimate global population size of McKay's Buntings.

- Identify key habitats associated with high abundance and reproductive success.

Design

Systematic sample of transects 1.5 km or 0.5 km apart.



Line transects with distance estimated to lone birds and centers of flocks within 100 m of line.

Surveys conducted from 30 May to 29 June.

Monitored nests near camps.

Results

- Counted 2,400 birds in 1415 flocks.
- Surveyed 201.9 km of transect.
- Proportion of islands sampled: 12%.
- Simple extrapolation: 20,000 birds.

$$Density = \frac{n \cdot f(0) \cdot E(s)}{2 \cdot L}$$

n / L = number of flocks per km	82%
$f(0)$ = detection function	16%
$E(s)$ = number of birds per flock	2%

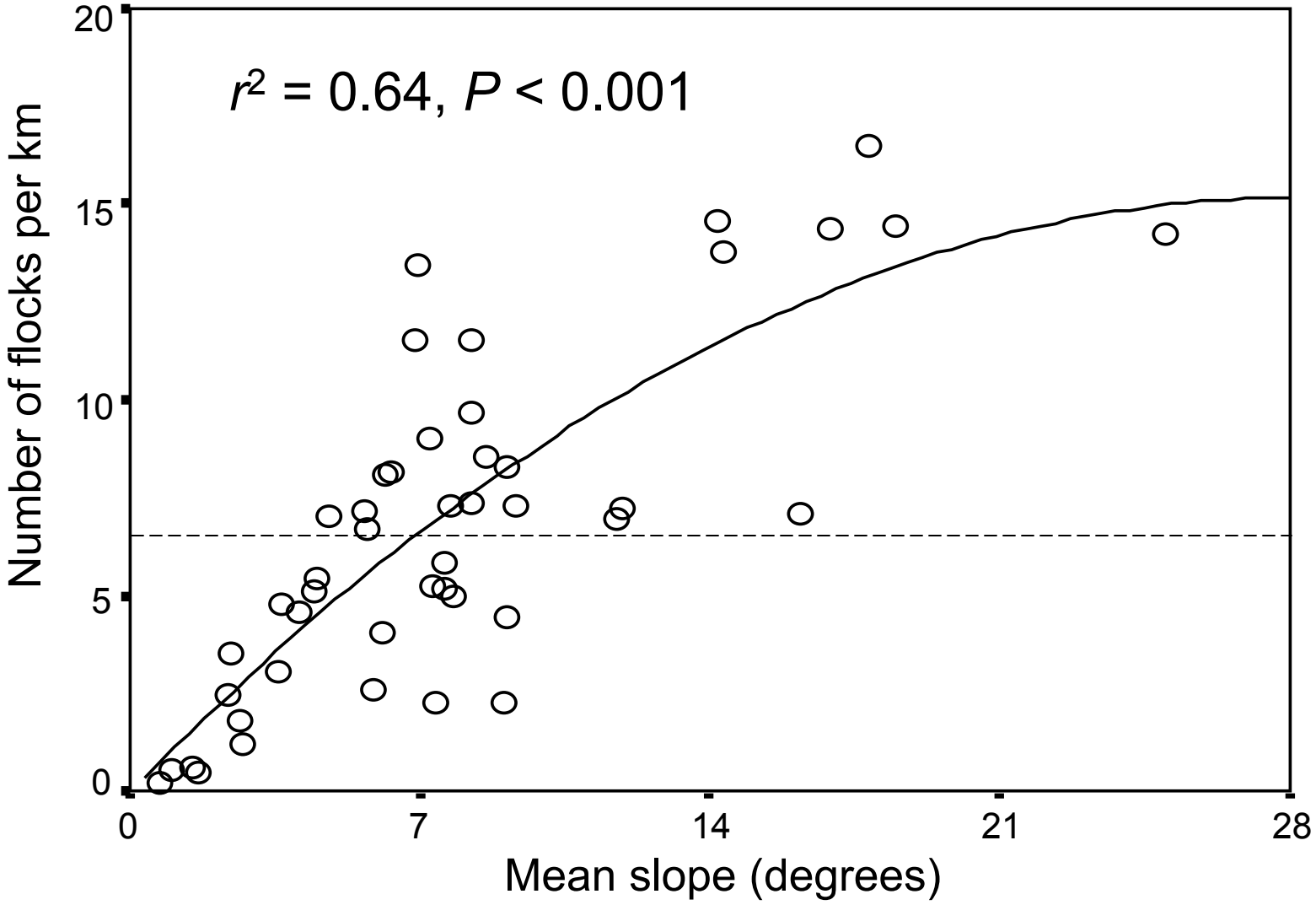
$$Density = \frac{n \cdot f(0) \cdot E(s)}{2 \cdot L}$$

n / L = number of flocks per km 82%

$f(0)$ = detection function 16%

Covariates: slope, elevation

Models of encounter rate




Arctic Fox


Red Fox

$$Density = \frac{n \cdot f(0) \cdot E(s)}{2 \cdot L}$$

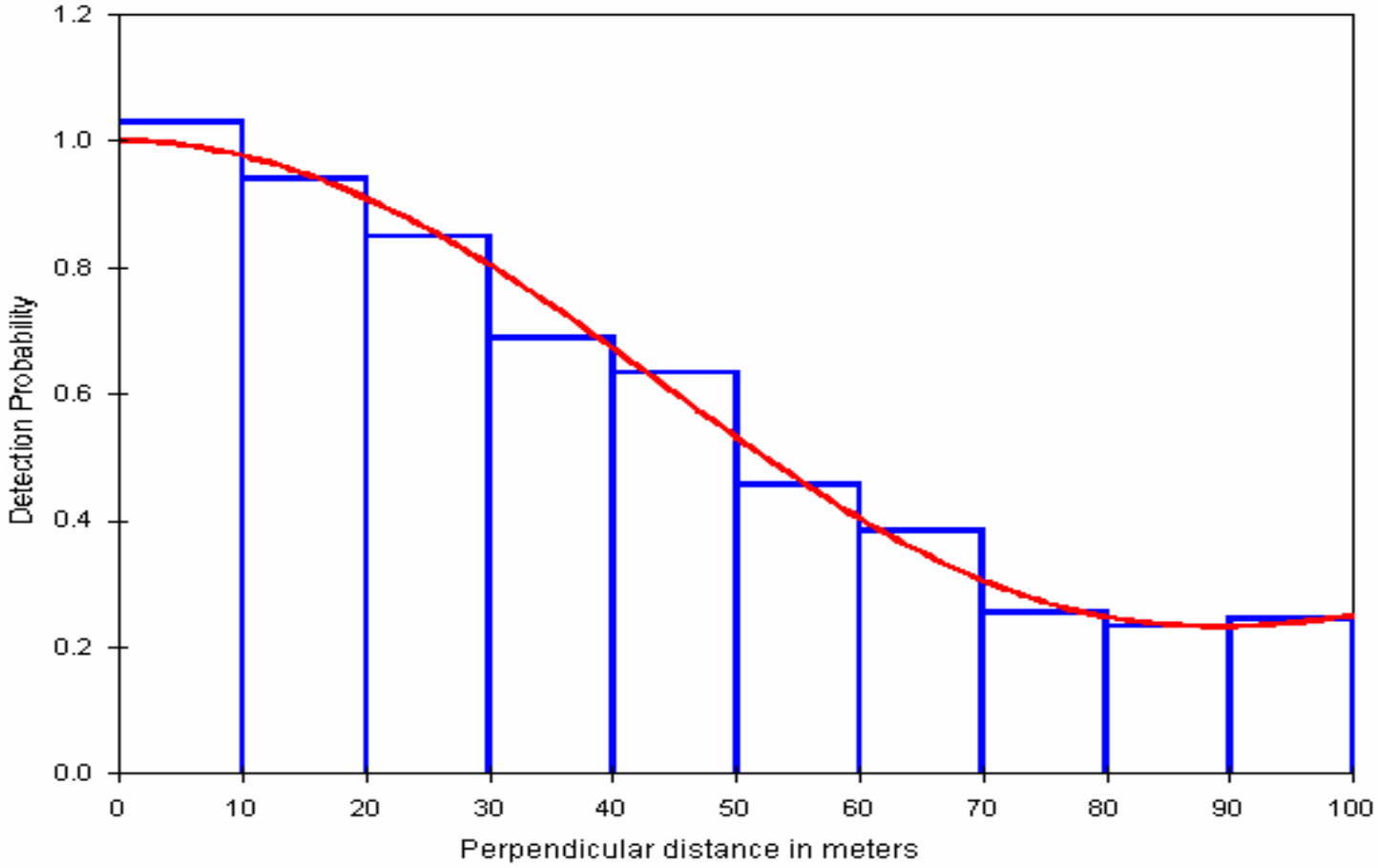
n / L = number of flocks per km 82%

$f(0)$ = detection function 16%

$E(s)$ = number of birds per flock 2%

$f(0)$ = detection function

Covariates: date, island, topography, observers, habitat



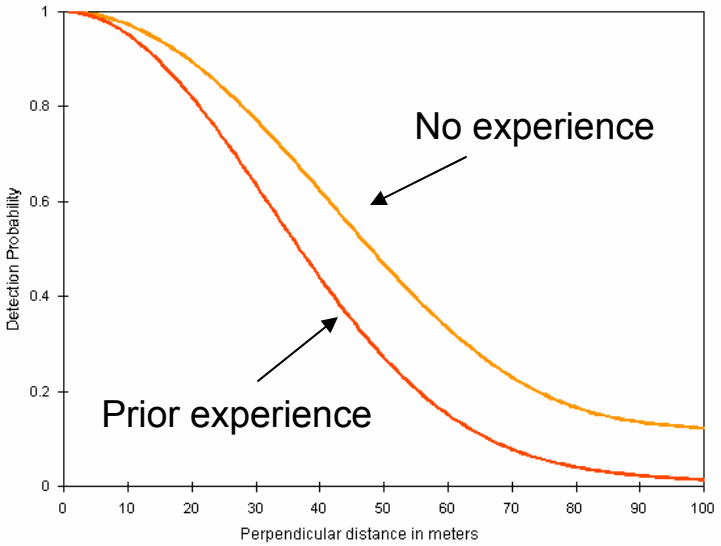
Models of detection function

Covariate	AIC_c	ΔAIC_c	Number of Parameters
Observer experience + Vegetation Class	5743.4	0.0	7
Observer experience	5754.9	11.5	4
Observer	5759.4	16.1	7
Vegetation Class	5761.4	18.0	6
No effects	5777.8	34.5	3
Date	5779.3	36.0	4
Slope	5779.4	36.1	4
Elevation	5779.8	36.4	4
Island	5779.8	36.5	4

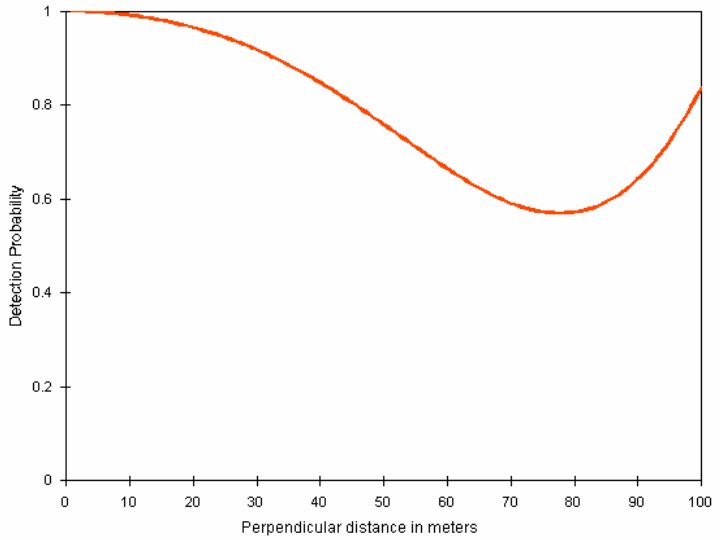
Models of detection function

Covariate	AIC_c	Δ AIC_c	Number of Parameters
Observer experience + Vegetation Class	5743.4	0.0	7
Observer experience	5754.9	11.5	4
Observer	5759.4	16.1	7
Vegetation Class	5761.4	18.0	6
No effects	5777.8	34.5	3
Date	5779.3	36.0	4
Slope	5779.4	36.1	4
Elevation	5779.8	36.4	4
Island	5779.8	36.5	4

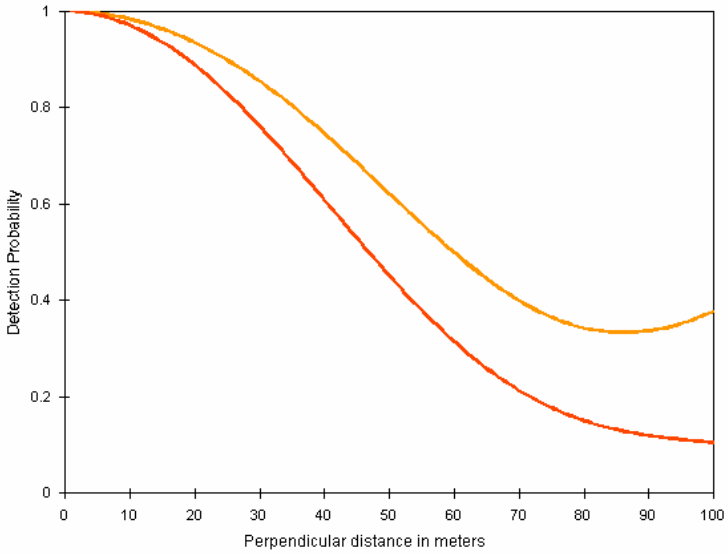
Beaches, snow fields, cliffs (2%)



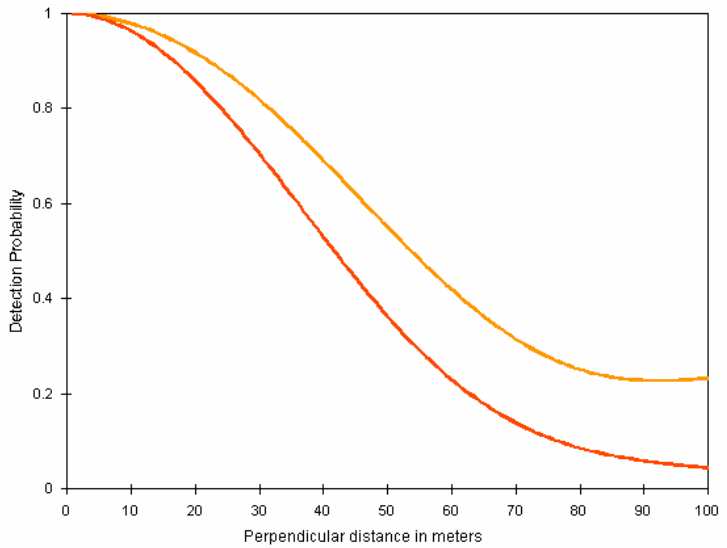
Meadows (8%)



Tundra (44%)



Rocky uplands (46%)



Models of global population size

Detection function	Encounter rate	*N*	CV	95% CI
No covariates	No stratification	33,632	9.2%	28,000 40,397

Models of global population size

Detection function	Encounter rate	*N*	CV	95% CI
No covariates	No stratification	33,632	9.2%	28,000 40,397
Obs exp + Veg class	No stratification	32,349	8.6%	27,208 38,460

Models of global population size

Detection function	Encounter rate	*N*	CV	95% CI
No covariates	No stratification	33,632	9.2%	28,000 40,397
Obs exp + Veg class	No stratification	32,349	8.6%	27,208 38,460
Obs exp + Veg class	Stratified by slope	32,349	6.9%	28,135 37,193

Conclusions

- Rocky habitats on steep slopes were important.

- Estimate of 32,000 birds was 5-16 times more than previously suspected.

- Modeling the subcomponents of abundance increased precision in estimates considerably.

Future

- Model abundance relative to availability of habitat.
- Develop protocols for long-term monitoring.
- Describe nesting ecology.
- Assess the status of wintering populations.